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### (54) Antibacterial and fungicidal chain

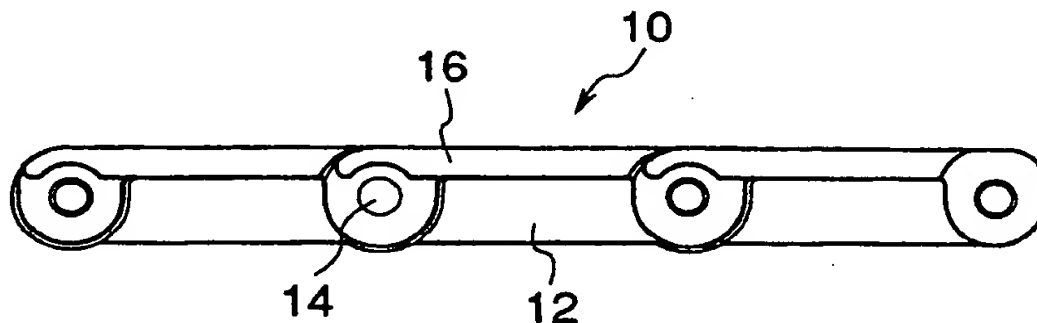
(57) [PURPOSE] The growth of bacteria and fungi on a chain for conveying products such as food and medicines is suppressed.

#### [CONSTITUTION]

A chain 10 comprises components of resin links 12

and resin link pins 14 with the same shape. The links 12 and link pins 14 are formed by molding the mixture of polyacetal as resin material and 0.1 to 5.0 % by weight of an inorganic antibacterial agent containing silver such as silver phosphate salt glass, which antibacterial agent is dispersed homogeneously in the resin material.

FIG.1



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## Description

### (DETAILED DESCRIPTION OF THE INVENTION)

#### (Field of Utilization in Industry)

This invention relates to a chain for conveying products which is protected from bacteria and funguses.

#### (Prior Art)

Chains for conveying food and medicines thereon the components of which chains made partially or wholly of resins such as polyacetal have been widely used.

#### (Problem to be Solved by the Invention)

However, such conventional chains are not antibacterial and fungicidal, therefore, when the chain is used wet or used for a conveyor line in a humid atmosphere, bacteria and funguses grow on soils on the chain, such growth is a problem of conventional chains. To cope with the growth, it is required to sterilize periodically by antibacterial solution, heat, and ultraviolet ray, and to pay sufficient attentions to keep products clean.

On the other hand, when antibacterial solution is used for sterilizing products such as food, impact on the human health is not completely avoided, and also resin components of the chain is deteriorated gradually by acid or chlorine contained in the antibacterial solution. High temperature sterilization and ultraviolet sterilization also deteriorate resin components of the chain disadvantageously.

#### (Means for Solving the Problem)

The present invention provides an antibacterial and fungicidal chain incorporated with chain components comprising a mixture of resin material and antibacterial agent for solving the above-mentioned problem.

#### (Operation)

Chain components in which antibacterial agent is dispersed homogeneously is formed by mixing previously a resin material and antibacterial agent followed by molding of the mixture to form chain components. The component itself is antibacterial and fungicidal, therefore, even when the chain is soiled with water drops and food, the growth of bacteria and funguses is prevented.

Antibacterial agents are categorized to inorganic antibacterial agents and organic antibacterial agents. The sterilization power of inorganic antibacterial agents is strong in the order of antibacterial agents containing mercury, silver, lead, copper, nickel, zinc, and cadmium, and among these agents the agent which scarcely impact on human health and is excellent in safety is

inorganic antibacterial agents containing silver.

Examples of antibacterial agents containing silver include, for example, silver phosphate salt glass, silver phosphate zirconium, silver zeolite, silver hydro-apatite, and silver phosphate salt ceramics. It may be possible to replace silver of an antibacterial agent with another metal mentioned above.

Preferable examples of organic antibacterial agents include isothiazoline antibacterial agents and benzoic acid antibacterial agents.

In the case of using an inorganic antibacterial agent containing silver, the content of the antibacterial agent is preferably 0.1 to 5.0 % by weight to resin material. If the content of an antibacterial agent is less than 0.1 % by weight, the sterilizing power is not sufficient, on the other hand, if the content of an antibacterial agent exceeding 5.0 % by weight results in reduced material properties such as tensile strength, fatigue strength, and impact strength, and the chain can not play a role as chain.

#### (EXAMPLES)

Examples of the present invention will be described hereinafter referring to the drawings. The present invention involves chains for conveying products mainly such as food and medicines, however, the invention is by no means limited to these applications.

Fig. 1 and Fig. 2 are a front view and bottom view of a table top chain which is suitably used for conveying food. In the figures, a chain 10 has links 12 and link pins 14 as component. Links 12 are the same shape and linked with link pins 14 each other in the conveying direction. The link 12 has a top member 16 with flat top face, products such as food are placed directly or indirectly on the top member 16. Links 12 are made of resin material, however, link pins 14 are not necessarily made of resin material because high shearing strength is required and the top member does not contact directly with products. However, it is desirable to form all components of links 12 and link pins 14 with resin material.

In this example, the table top chain for conveying food is described as an example, however, the present invention is not limited to the application of the above-mentioned food conveying and not limited to the chain type of table top chain.

Another example of chain type includes an accumulation conveyor chain comprising chain components of link plates, link pins, bushes, and rollers. In this case, only a partial chain components, namely rollers, may be made of the mixture of resin material and antibacterial agent. However, all components may be made of the mixture of resin material and antibacterial agent, and otherwise, rollers and link plates may be made of the mixture of resin material and antibacterial agent.

Popular resin material is polyacetal, and polyacetal resin is used for links 12 in this Example, but polypropylene, polyethylene, polybutylene-terephthalate, polyamide, polyphenylene-ether, and fluoro-resin may be

used. Link pins 14 also may be made of these same resins.

Chains 10 of the present invention are made of an above-mentioned resin added with an antibacterial agent. Antibacterial agents are categorized to inorganic antibacterial agents and organic antibacterial agents. Inorganic antibacterial agents are preferably used because of excellent heat resistance comparing with organic antibacterial agents. The sterilization power of inorganic antibacterial agents is strong in the order of antibacterial agents containing mercury, silver, lead, copper, nickel, zinc, and cadmium, and among these agents the agent which scarcely impact on human health and is excellent in safety is inorganic antibacterial agents containing silver.

Examples of antibacterial agents containing silver include, for example, silver phosphate salt glass, silver phosphate zirconium, silver zeolite, silver hydro-apatite, and silver phosphate salt ceramics.

Preferable examples of organic antibacterial agents include isothiazol ine antibacterial agents and benzoic acid antibacterial agents.

Chain components are formed as described herein under. An antibacterial agent is mixed homogeneously with resin material such as polyacetal beforehand. The content of the antibacterial agent is preferably 0.1 to 5.0 % by weight to resin material. If the content of an antibacterial agent is less than 0.1 % by weight, the sterilizing power is not sufficient, on the other hand, if the content of an antibacterial agent exceeding 5.0 % by weight results in reduced material properties such as tensile strength, fatigue strength, and impact strength, and the chain can not play a role as chain.

The mixture of the resin material and antibacterial agent in the prescribed ratio is molded to a desired shape using a molding machine such as injection molding machine. By molding chains as described above, the antibacterial agent is dispersed homogeneously in the resin material, thereby, the antibacterial agent will not be lost by evaporation and dissolution, thus, antibacterial effect and fungicidal effect is active for long years. Possible wearing and cracking of the chain components will not affect adversely on the antibacterial and fungicidal performance.

#### (Effect of the Invention)

According to the present invention, an antibacterial agent is contained in resin material, thereby, the chain can be used for conveying food without periodical cleaning and sterilization because of antibacterial effect and fungicidal effect of the antibacterial agent. The antibacterial agent is mixed previously with resin material and the mixture is molded to form chain components in stead of coating of the antibacterial agent on the chain component, therefore, the antibacterial agent will not be lost from the chain components by evaporation and dissolution, the antibacterial effect and fungicidal effect last forever, chains in accordance with the present invention

is suitable for conveying products which must be kept clean.

In the claim 2 of the present invention, inorganic antibacterial agents containing silver is used as the antibacterial agent, therefore, the present invention provides chains used preferably in the field involving human health and hygiene.

In the claim 3 of the present invention, the chains contains 0.1 to 5.0 % by weight of an antibacterial agent to resin material, therefore, in the content range the present invention provides the chains with antibacterial effect and fungicidal effect, and product conveying capability.

#### (BRIEF DESCRIPTION OF THE DRAWINGS)

(Fig. 1) Fig. 1 is a front view of a table top chain to which the present invention is preferably applied.

(Fig. 2) Fig. 2 is a bottom view of the table top chain in Fig.1.

#### (DESCRIPTION OF REFERENCE CHARACTERS)

10	chain
12	link
14	link pin
16	top member

#### Claims

1. An antibacterial and fungicidal chain incorporated with chain components comprising a mixture of resin material and antibacterial agent.
2. A chain as claimed in claim 1, wherein said antibacterial agent is an inorganic antibacterial agent containing silver.
3. A chain as claimed in claim 2, wherein said antibacterial agent is contained in an amount of 0.1 to 5.0 % by weight to said resin material.

FIG.1

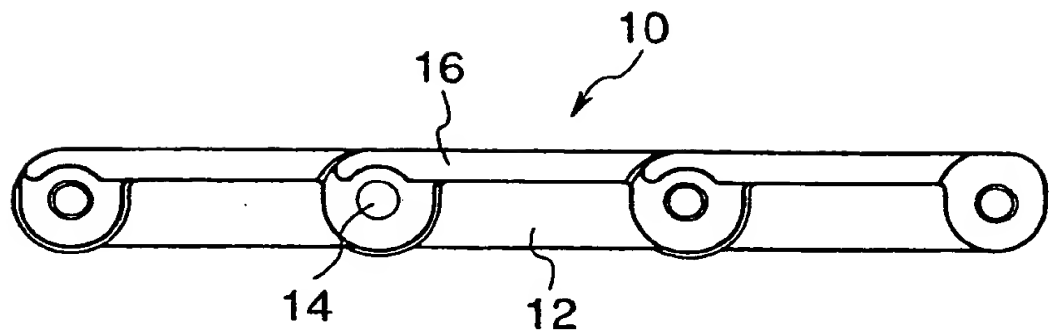
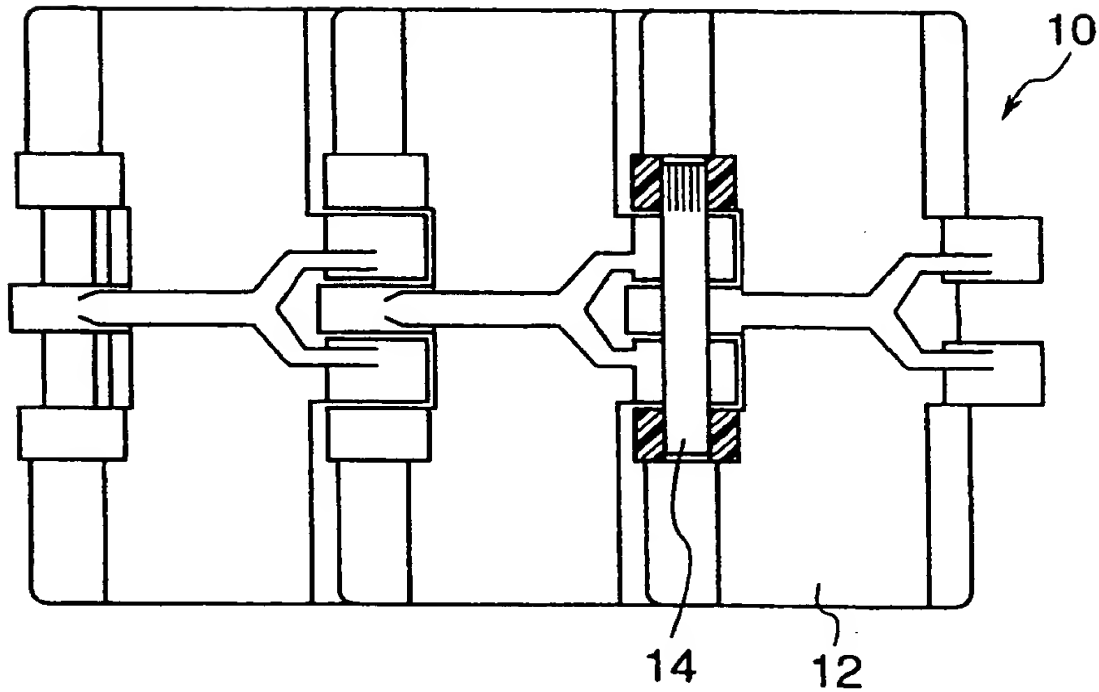


FIG.2





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# EUROPEAN SEARCH REPORT

Application Number  
EP 96 10 6806

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	DE-A-43 44 306 (KRALL THEODOR DIPL ING) 30 June 1994 * claim 1 *	1-3	A01N25/00 C08K11/00
X	EP-A-0 190 504 (JOHNSON MATTHEY PLC) 13 August 1986 * claims 1-5 *	1-3	
X	EP-A-0 606 762 (JAPAN SYNTHETIC RUBBER CO LTD) 20 July 1994 * claim 1 *	1-3	
X	EP-A-0 427 858 (KANEBO LTD ; TANAKA PRECIOUS METAL IND (JP)) 22 May 1991 * claims 1,2,10 *	1-3	
X	DE-A-44 04 680 (SUH KANG IL) 18 August 1994 * example 1 * * claims 1,3,4 *	1-3	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			C08K
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 3 October 1996	Examiner Siemens, T
<p><b>CATEGORY OF CITED DOCUMENTS</b></p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons A : member of the same patent family, corresponding document</p>			

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